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ABSTRACT

Although various assessments differ in notable ways, they often follow a plan that is thoroughly tested and features four basic steps: (1) selecting learning areas and identifying their objectives; (2) developing achievement test items to determine the degree to which these objectives are accomplished; (3) administering the test items to representative samples of students and gathering background data about them; and (4) analyzing the results and disseminating them to administors, board members, legislators, and the public. The largest, most informative assessment ever designed follows this general plan very closely. It is the National Assessment of Educational Progress (NAEP), for which planning began in 1964. It is designed to obtain census-like data on the knowledges, skills, concepts, understandings, and attitudes possessed by young Americans in a variety of learning areas; and to measure the growth or decline of these achievements that occurs over time. This publication describes the NAEP and some major findings of the first assessments in various areas, and then offers a speculative view of our schools. Surveys like the NAEP serve as excellent vehicles for generating hypotheses about causes of achievement fluctuations, which in turn can be studied more intensively by designing appropriate experiments or conducting thorough case studies. (RC)

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# HOW MUCH ARE OUR YOUNG PEOPLE LEARNING?
## THE STORY OF THE NATIONAL ASSESSMENT

**Stanley Ahmann**

**FASTBACK 68**

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Series Editor, Donald W. Robinson

# HOW MUCH ARE OUR YOUNG PEOPLE LEARNING? THE STORY OF THE NATIONAL ASSESSMENT

By J. Stanley Ahmann

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# TABLE OF CONTENTS

**The Need for Assessing Achievement** ..... 5
Methods of Assessing Student Achievement ..... 6
The National Assessment of Educational Progress: Goals and Methods ..... 9

**Profiles of Student Achievement** ..... 13
Major Findings: First Assessments by National Assessment ..... 13
Major Findings: Changes in Levels of Achievement ..... 21

**Our Schools: A Speculative View** ..... 28
Perspectives about NAEP Findings ..... 28
Next Moves ..... 34

**Annotated Bibliography** ..... 37

## THE NEED FOR ASSESSING ACHIEVEMENT

Have you tried to balance your checkbook lately? If so, with what success? For most of us in our post-secondary school years this is (or should be) a monthly task, one which we probably view with mixed feelings. The cause of these feelings is easily identified: Balancing a checkbook is difficult even though it requires only simple addition and subtraction. Are you surprised to know that when a national sample of young adults (ages 26 to 35) received canceled checks, a bank statement, and a personal register in which checks had been recorded, barely 16 percent could reconcile the personal record with the bank record?

Now consider another everyday activity—voting. A typical ballot was given to 17-year-olds and young adults and, with it before them for careful study, five questions were asked about the voting options available. About 41 percent of the 17-year-olds and 44 percent of the young adults could answer these questions.

Finally, a small section of an ordinary television schedule was shown to young Americans of ages 9, 13, 17, and 26 to 35, and five questions were asked about the program selections available. When allowed generous time limits and ample opportunity to refer repeatedly to the printed schedule, approximately 11 percent of the 9-year-olds, 34 percent of the 13-year-olds, 53 percent of the 17-year-olds, and 62 percent of the young adults were able to answer the questions.

What is your reaction to these percentages? Do you find the success rates pleasing or disturbing? Are they consistent with your levels of expectation? In short, do these results suggest

that our educational system is largely succeeding or failing in these instances? These are important questions that deserve answers.

To be sure, the foregoing three examples provide only a few isolated bits of information about the achievements of American youth. Suppose that we had hundreds more, collectively representing all of the major learning areas of concern to schools. Actually many hundreds are available—the products of a major national achievement survey designed to obtain solid data about the principal outcomes of our education system—in other words, what students are learning. With those in hand, we are better able to understand our educational programs and formulate impressions about them.

Too frequently our opinions about the quality of American schooling are based only on rather vague general impressions from the past and a scattering of recent firsthand experiences. Useful as these are, they fail to provide a broad, strong basis for making the complex educational decisions we face. Now more than ever we need definitive information about the achievements of American youth. After careful study of such information, we should be better able to identify the strengths and weaknesses of our educational enterprise, then mount bold, innovative programs to improve it where necessary.

Traditionally, accreditation procedures have provided good information about the inputs and processes of education but little about the outcomes. In the last decade, assessments of student outcomes have been developed and implemented, which supplement the accreditation efforts very well. These are census-like surveys of levels of student achievement, emphasizing the students' intellectual changes that have occurred largely because of schooling. Typically they provide hard data about students as groups, not as individuals, and thereby familiarize us with the "big picture" of student change.

### Methods of Assessing Student Achievement

Every day major national surveys are completed and their results disseminated to the public. Most prominent is the population census taken every ten years. Also highly visible are health

statistics concerning various diseases, unemployment data, the gross national product, and the consumer price index. These are closely watched, and decision makers respond to them. Economic data such as changes in unemployment levels, for example, can cause government units to adjust their estimates of tax income, public officials to modify their economic and social programs, and investors to increase their buying or selling of common stocks. The consumer price index is tied to a number of major labor contracts and retirement programs, and its major fluctuations can cause income shifts for many thousands of people.

In education we are now developing data of comparable importance through local, state, and national assessments. Their purpose is to determine levels of student achievement in major learning areas schools are concerned with, repeating the measurements every three to six years to discover changes. Needless to say, the direction and size of such changes are of vital interest to educational decision makers.

*A General Plan for Assessment*

Although various assessments differ in notable ways, they often follow a general plan that is thoroughly tested. It has four basic steps:

1. Selecting learning areas and identifying their objectives.
2. Developing achievement test items to determine the degree to which these objectives are achieved.
3. Administering the test items to representative samples of students and gathering background data about them.
4. Analyzing the results and disseminating them to educators, board members, legislators, and the public.

**Learning areas and their objectives.** The learning areas to be included must be selected and the objectives and subobjectives of these areas must be determined. Often the assessment concentrates on the basic skills of reading, writing, and mathematics. Sometimes content areas like science and social studies are added. These selections are made with the help of advisory committees composed of the public, teachers, and specialists. Their choices represent the most pressing needs for information existing at that time.

Committees of the same general composition then tackle an even more difficult task: formulating the major and subob-

jectives of each learning area. As an illustration, in science they might agree that a major objective is, "The student knows the fundamental facts and principles of science." The many subobjectives included within this major objective would deal with knowledge of facts and simple concepts, laws and principles, conceptual schemes, and the scientific enterprises.

Since these are consensus objectives, they do not include all aspects of the learning area. But beyond question they do represent the main core of the subject matter—the central ideas about which every school should be concerned.

**Developing measuring instruments.** How can we tell the degree to which the objectives have been achieved? It's simple—by administering appropriate achievement tests to a representative sample of students. But as the objectives change so should the tests. This means that it is highly unlikely that suitable tests can merely be purchased. Most often they must be new tests specifically designed in terms of the objectives of the learning area being assessed. Thus the test is tailored to these objectives.

Building tailored tests of this kind is time consuming and expensive. Generally speaking, at least one and perhaps ten or more test items are used for each major or subobjective. The number varies considerably, depending upon the number of objectives, the amount of testing time available, and the type of information needed.

Each test item should be designed so that it relates directly to the objective under consideration. In this way determining the percentage of students who can answer the test item correctly provides an estimate of the degree to which the objective has been achieved. Inspection of wrong answers offers insights into the origin of faulty learning and possible remedial actions.

As you can see, the foregoing testing method places much emphasis on the responses of *group* of students to a *single* test item, rather than the responses of a *single* student to *many* test items. The second method is the one commonly used in classrooms today to identify the relative standing of a student in relationship to his peers. Such tests perform this function well but cannot be easily used in modern assessment plans.

**Administering the achievement test items.** Rarely is it necessary or even desirable to administer all test items to all students. Often the sampling techniques used permit high quality data about levels of student achievement to be obtained by administering a part of the total group of test items to a sample of students. The student sample can be obtained by randomly selecting students from a defined population of students (for example, all 13-year-olds in a school district) or classes of students from a defined population of classes (for example, all eighth grades in a school district).

Background data about the student and the school are extremely helpful when interpreting the achievement data. In relation to the student, these might include the educational level and socioeconomic status of parents. For the school, commonly gathered data are the average class size, average per student cost, and major features of the curriculum and teaching methods used. If substantial persistent relationships can be found between the outcomes (that is, levels of achievement) and the inputs and processes, then decision makers have sturdy tools with which to direct efforts to improve the educational process.

**Analyzing the data and disseminating the findings.** Data analyses vary because they are designed to fit the specific features of the data-gathering effort. Nevertheless, three themes are usually found. First, the results are often reported both on the success/failure rate of groups of students on each test item and on clusters of very similar test items (for instance, all test items associated with a given objective). Second, estimates are made of the relationships between levels of achievement and input and process variables, or combinations of them. Third, small, trivial differences and relationships are ignored. They are not educationally important.

Multiple reports are written because multiple audiences exist. A series of reports covering a variety of learning areas during a period of years is an unmatched reservoir of information of high quality, useful in a variety of ways for improving education.

### The National Assessment of Educational Progress: Goals and Methods

The largest, most informative assessment ever designed follows

the general plan described very closely. It is the National Assessment of Educational Progress (NAEP), for which planning began in 1964. Its basic goal is to describe what young Americans know and can do. More specifically, it is designed 1) to obtain census-like data on the knowledges, skills, concepts, understandings, and attitudes possessed by young Americans in a variety of learning areas; and 2) to measure the growth or decline of these achievements that occurs over time.

To accomplish the foregoing, NAEP selected ten learning areas for assessment and formulated objectives and subobjectives for each with the help of committees of teachers, scholars, and concerned lay people. For an objective or subobjective to be useful in the assessment, there must be agreement that it is reflective of acceptable teaching goals, important for a young person in today's society, and meaningful to subject-matter specialists.

The learning areas selected include those receiving primary attention in the elementary and secondary schools (for example, the basic skills) and some of those receiving secondary emphasis (for example, music and art). The ten areas are:

| | |
|---|---|
| Reading | Citizenship |
| Writing | Music |
| Mathematics | Art |
| Science | Literature |
| Social Studies | Career and Occupational Development |

Four age groups were chosen for testing: 9-year-olds, 13-year-olds, 17-year-olds, and young adults (ages 26 to 35). The first three ages represent crucial points in one's educational career, while the last is at or beyond the terminal point of most formal education. Annually NAEP draws national samples of young Americans in most or all of these age groups and measures their levels of achievement in one or more learning areas.

After the objectives and subobjectives are established in a learning area, test items are constructed to represent each of them. Some of these test items are unlike those found in the tpyical achievement tests used in schools. Varieties of materials, including motion pictures, graphs and tables, audio presentations, and narrative texts are used as the basis for the student's task. Furthermore, the type of student response required varies from

checking a correct answer or providing lengthy written responses (such as writing an essay or giving reasons for an answer), to performing (such as using scientific apparatus, singing and playing instruments, and drawing a picture).

Levels of achievement in a learning area are determined by administering test items to young Americans selected in the national sample. No one is tested more than once, but some test items are used a second or third time when a learning area is reassessed.

*Assessment Schedules*

In large measure, NAEP follows a systematic plan for assessing achievement levels in the ten learning areas. Those assessments completed are listed in Table 1.

**Table 1**
**Assessments Completed by the**
**National Assessment of Educational Progress**

| Year | Learning Area |
|---|---|
| 1969-70 | Science, Writing, Citizenship |
| 1970-71 | Reading, Literature |
| 1971-72 | Music, Social Studies |
| 1972-73 | Mathematics, Science* |
| 1973-74 | Career and Occupational Development, Writing* |
| 1974-75 | Ar , Reading* |
| 1975-76 | Citizenship/Social Studies* |

*Second Assessment

Of crucial importance are the second assessments. The result of a thorough reexamination of the objectives, they involve reusing about one-half of the test items from the first assessment with a new sample of young Americans in most or all age groups. Now NAEP is measuring changes in levels of achievement.

Visualize, if you will, a third and fourth assessment, each following its predecessor by three to six years. By this means achievement trends over time can be known. National Assessment

is very ambitious in its plans for future reassessments, preparing for succeeding assessments while it completes initial ones. Imagine the questions that can be answered, at least in part, by the data produced. For example:

1. Are the 9-year-olds living in the inner city developing their reading skills so rapidly that their achievement in this learning area will probably approach the national level within the next decade?
2. Is there any shift over time in terms of understanding and applying the First Amendment to the Constitution by young adults living in the Northeast as contrasted with those living in the Southeast?
3. Will young Americans living in rural areas continue to improve their skills in science at a rate that far exceeds that of the nation as a whole?
4. Are 17-year-old and young adult women raising their level of proficiency in consumer mathematics to a degree that will significantly reduce the gap between them and men of the same ages?
5. Will the direction and amount of change in levels of achievement in the basic skills be the same, for all practical purposes, as those in the general subject-matter areas (for example, science and social studies) or the fine arts (for example, music and art)?
6. If the levels of achievement in a learning area drop as time passes, what are the specific knowledges, understandings, skills, and attitudes with the greatest weaknesses and toward which special remedial programs can be directed.

In order for NAEP to answer questions such as these, it must maintain a high degree of productivity for a long period of time. Examining the highlights of its findings provides a good idea about the productivity needed.

## PROFILES OF STUDENT ACHIEVEMENT

Within each of the ten learning areas, National Assessment determines the percentages of the respondents at each age who can acceptably answer a question or successfully perform a task. The number of questions and tasks used in each assessment varies according to the learning area, ranging from 300 to more than 500. The primary manner of reporting National Assessment results is to report the percentage success and failure for various subgroups of students and young adults for each test item or groups of similar test items. Consequently, literally thousands of pieces of data are available about the performance level of American youth in the learning areas reported.

The percentages of acceptable and unacceptable responses for each test or cluster of related test items are reported by age groups, and, within each age group, by sex, geographic region, level of parental education, size and type of community, and race. Thus rough but useful profiles of student achievement are created. Table 2 presents a more detailed breakdown of the classifications used.

### Major Findings: First Assessments by National Assessment

Summarizing the findings of the first assessments by National Assessment is most difficult. The following are a few of the highlights resulting from assessing nine learning areas—all the areas tested except art.

**Table 2**
**Subgroups of the NAEP National Sample Used for Reporting Results**

| Classification | Subgroups |
|---|---|
| Age level | 9, 13, 17, 26 to 35 years |
| Sex | Male<br>Female |
| Geographic region | Northeast<br>Southeast<br>Central<br>West |
| Level of parental education | No high school<br>Some high school<br>Graduate from high school<br>Post high school |
| Size and type of community | Inner city<br>Affluent suburb<br>Rural area<br>Main big city<br>Urban fringe<br>Medium-size city<br>Small city |
| Race | Black<br>White |

*General Trends*

When each of the learning areas is considered as a composite, one finds a large degree of consistency within National Assessment findings from one learning area to another. This is to say that the differences in relative achievement among subgroups of the sample are largely consistent in direction even though they are not totally consistent in size. This can be illustrated by examining the achievement levels of some of these subgroups.

**Regions of the country.** The level of performance in the northeastern portion of the country is typically higher than in the other three regions in all nine learning areas reported. This

is less noticeable in the young adult group than in other age groups. The lowest level of performance is consistently found in the southeastern region. It should be noted, however, that these differences are comparatively modest. For example, the Southeast is normally no more than 5 percent below the national average.

In the western region, the achievement of 9-year-olds is often below national levels, but by adulthood achievement is usually above national levels. All four age groups of young Americans in the central region typically perform at or slightly above national levels.

**Size and type of community.** Consider for a moment the performance of young Americans from the inner city, the rural areas, and the affluent suburbs. The first group typically achieves least well by a wide margin. These deficits are smaller, but still serious, for citizenship and music. The rural youth do somewhat better but still perform well below the national average. On the other hand, with the exception of young adults, their achievement levels in social studies and music are only slightly below the national average. Finally, the affluent suburb groups exceed the national average consistently by an important margin. This is most noticeable in mathematics.

**Sex.** Male-female differences in achievement vary. Female respondents generally achieve at higher levels than male respondents in many learning areas. The exceptions are science and mathematics, with little difference existing in citizenship and social studies. In some areas, the female superiority in achievement is more pronounced at the school ages than for young adults.

In science male respondents achieve at a consistently higher level, the advantage increasing with age. In mathematics the picture is mixed. Females have a better command of the computational aspects of arithmetic at age 13 but fail to achieve as well as men when young adults. In consumer mathematics, the level of achievement of males surpasses that of females at all ages, with the smallest difference at age 13 and increasingly larger differences at ages 17 and young adult.

**Educational level of parents.** The highest level of education of either parent of a respondent is classified into one of four

categories: no high school, some high school, graduated from high school, and post high school training. The last category includes any kind of formal education following high school graduation.

It is clear from the NAEP data that the educational level of the parent of the respondent is also a vital factor in the student's level of achievement. Young Americans with parents who have only a grade school education perform least well of all. As the level of the parents' education increases to some high school, then to completion of high school, and ultimately to post high school education, the performance level of the respondent increases markedly and with striking consistency in all nine areas of achievement reported. Particularly vivid examples of this trend are found in the basic skills—mathematics, writing, and reading.

**Race.** Assessment data for whites and blacks only are reported by National Assessment. Achievement levels for blacks typically fall below the national average, while those for whites are above. This pattern is very pronounced in science, writing, reading, literature, social studies, and mathematics, less extreme but still notable in citizenship and music.

*Reporting Assessment Data Test Item by Test Item*

The general trends reported by NAEP paint a thought-provoking picture using only broad strokes. Much fine detail is lost. After all, it is much less useful to study the assessment data for each learning area as a composite than it is to examine group responses to clusters of similar test items or, even better, individual test items one by one. In this way inferences can be drawn about the degree to which educational objectives have been achieved—the true goal of an assessment.

The following are very small samples of these data from each of the nine learning areas. These areas are classified in three groups: basic skill areas, general subject-matter areas, and the humanities and fine arts areas.

*A Sample of Significant Findings: Basic Skill Areas*

Of the ten learning areas included in NAEP assessments, three are basic skills, namely, reading, writing, and mathematics. Listening and speaking skills are not assessed. Here are a few of the findings in these three areas:

**Reading (Assessment year: 1970-71).**

1. School-age males read less well than school-age females, but young adult men and women have about the same levels of reading achievement.
2. Many school-age youngsters cannot read and understand simple directions, such as those for playing a card game, using a can of spray, or baking muffins.
3. The overall reading ability of blacks is lower than that of whites. In some instances, the reading level of blacks is not as high as whites four years younger. Some evidence suggests that whatever factors contribute to this problem are influential before the age of 9.
4. A large proportion of 9-year-olds do not use dictionaries well, but about 90 percent of young Americans at the other three age levels have little difficulty. Furthermore, few respondents in these three age groups have any trouble using the contents page of a weekly news magazine.

**Writing (Assessment year: 1969-1970).**

1. Application blanks are a common writing task for Americans, but results show only about half of the nation's young adults actually fill in all the information required.
2. Males are more adventurous and free in writing essays, though females demonstrate a better command of writing mechanics.
3. Nine-year-olds have limited vocabularies, restricted skill in sentence construction, and incomplete understanding of the conventions of written English. Furthermore, about half of the 17-year-olds have some command of the basics of written English, but they typically produce only simple sentences, use common words, and express simple ideas.
4. Commas are the most difficult form of punctuation to master for all age levels.

**Mathematics (Assessment year: 1972-73).**

1. About three-fourths of the 9-year-olds, more than 90 percent of the 13-year-olds, and about 95 percent of the 17-year-olds can successfully complete simple addition regrouping problems involving one- and two-digit numbers.

2. Performance on subtraction test items is generally lower than on addition exercises. Young adults have difficulty working with decimals and fall below the achievement levels of 17-year-olds in this area.
3. Fewer than half of the 17-year-olds and young adults can successfully determine the most economical package size of food products when making cost comparisons.
4. Performance in consumer mathematics is definitely below the national average for young Americans who live in the inner city, who live in the Southeast, who are black, and whose parents have little or no high school education. Frequently those who have least money to spend are also those lacking skills to manage it.

*A Sample of Significant Findings: General Subject-Matter Areas*

Social studies and science are subject-matter areas of considerable prominence in today's schools. They are substantial parts of both the elementary and secondary school curriculum. Citizenship, which is much like social studies, is included in this group as well, even though it is not a well-structured part of the curriculum and has a heavier attitudinal component than other parts. Its importance is unquestioned. Career education is becoming increasingly widespread at all grade levels, so career and occupational development have been included in the NAEP program. The following are a few highlights of the findings in these four learning areas.

**Social studies (Assessment year: 1971-72).**

1. In general, young Americans from low-income areas, from poorly educated families, and from the southeast region are less willing than their peers from other groups to defend freedom of the press, freedom of religion, freedom of assembly, and other freedoms guaranteed by the First Amendment to the Constitution.
2. Fewer than half of the 13-year-olds can accurately answer questions about the American Revolution.
3. Relatively few young Americans can read and interpret graphs, maps, or tables.
4. Most respondents have little knowledge of the contributions

of minority groups to American culture and history.

**Citizenship (Assessment year: 1969-70).**

1. An overwhelming majority of 17-year-olds (77 percent) and young adults (86 percent) know one or more ways citizens can influence the actions of their government, but fewer (54 percent and 61 percent, respectively) think that they personally can influence decisions of their state government.
2. Black 17-year-olds and adults say that they are willing to accept people of a different race in many different situations (except political representation) at least as often as all Americans of their age.
3. Seventeen-year-olds and adults in the inner city perform near or above national levels on tasks dealing with knowledge of local government, though they know considerably less than young Americans generally about the federal government.
4. Young adults in the Southeast are more aware of local problems and issues than those in either the Northeast or West, and they exceed the national level in their belief that they can influence local government actions.

**Science (Assessment year: 1969-70).**

1. In the inner city, 17-year-olds have less success in physical science than in biological science, while those in rural areas reverse this pattern.
2. Across all ages, young Americans from the affluent suburbs handle abstract facts and principles of science well. They do best on test items based on science knowledge learned in school.
3. The attitudes and curiosity of school-age blacks about science are roughly typical of all school-age American youth, but their mastery of scientific skills and knowledges is well below national levels.
4. At all four age levels, males demonstrate a more thorough knowledge of physical science, and females seem to have a better knowledge of biological science. This pattern is particularly apparent among young adults.

**Career and occupational development (Assessment year: 1973-74).**

1. Well over three-fourths of the young adults know whether oc-

cupational groups such as architects, ranchers, lawyers, carpenters, plumbers, and soldiers typically belong to a union. About three-fourths of the 17-year-olds possess the same information.

2. When real coins are used to test ability to make change, only about two-thirds of the 9- and 13-year-olds realize that they have not received the correct change when they are short-changed. Similarly, two-thirds of the 13-year-olds are able to make the right change for a simple purchase; roughly one-fifth of the 9-year-olds can perform this task successfully.
3. Slightly over one-third of the young adult females consider homemaking to be their principal job.
4. Black children of 9 and 13 years of age report doing household tasks without help more often than white children of the same ages. These tasks include cooking a complete meal for a family and ironing clothes.

*A Sample of Significant Findings: Humanities and Fine Arts Areas*

Rarely do assessments encompass learning areas in the humanities and fine arts. National Assessment includes three such areas—literature, music, and art. Large-scale testing in the last two areas has never been attempted before. It is difficult because in music and art the measurement of performance (for example, singing and drawing) has to be a vital part of the assessment. Here are some of the findings from the literature and music assessments.

**Literature (Assessment year: 1970-71).**

1. Seventeen-year-olds overwhelmingly believe that the study of literature is a positive experience; 90 percent believe literature should be part of every high school curriculum, and about 10 percent think that the study of literature increases one's tolerance for new and different ideas.
2. Among blacks, reading is considered a valuable activity, and some types of literature are read in greater proportions than are read nationally. At age 9, larger percentages of blacks report reading poetry; at age 13, considerably larger percentages of blacks read poetry and drama; and at age 17, more blacks read biographies and drama.

3. Female respondents read more than male respondents, particularly fiction and poetry. On the other hand, males have a greater interest in nonfiction, especially biography.
4. When asked to identify literary works and characters, 9- and 13-year-olds in the central region responded particularly well, as did 17-year-olds and young adults in the Northeast.

**Music (Assessment year: 1971-72).**

1. Individuals of all ages are interested in and like music. More than 80 percent of all age groups either play or would like to learn to play a musical instrument.
2. Judged on their ability to maintain pitch and rhythm and hit the right notes, fewer than half of the nation's youth can give an acceptable vocal performance of their own choosing.
3. Young Americans from the Southeast listen to more music, enjoy more kinds of music, and sing more music than their peers in other regions. Furthermore, black Americans demonstrate a greater ability to repeat and improvise rhythmic patterns than do whites.
4. Most respondents have only a limited knowledge of musical notation and terminology. Although they often can identify such notations as clef signs, note names, sharps, and flats, few know that two eighth notes equal one quarter note. Less than 15 percent of any age group can sight read even the simplest line of music.

### Major Findings: Changes in Levels of Achievement

The major findings from the first assessment by National Assessment are noteworthy in their own right. They display the strengths and weaknesses in achievements by American youth to a degree never before known. On the other hand, few reference points are available to be used when interpreting these data.

The results of the first assessment can be thought of as "bench marks." With these set up, one can now repeat a major part of the assessment three to six years later, and establish a second level of achievement that will reveal the direction of changes occurring and estimates of their sizes. This is invaluable information. The long-term trend of achievement is at least as meaning-

ful for decision making as the levels indicated by the original assessments.

The full meaning of the word progress in the title "National Assessment of Educational Progress" is now before us. NAEP is repeatedly measuring the levels of achievement of young Americans, using about half of the test questions from the first assessment of each learning area. Great care is exercised to be sure that the test items used and the objectives on which they are based are still pertinent when reused three to six years later.

Measurements of changes in levels of achievement have been completed in three learning areas. They are science, writing, and reading, using the schedule shown in Table 3. In science and writing standard procedures were followed, though data are reported for school-age groups only. In reading, a "mini" assessment, much more limited than a regular reading assessment, was conducted. Although a complete reading assessment was conducted in 1970-71, only one age group (17-year-olds in school) was retested in 1974, using a comparatively small part of the total number of test items. These questions were extracted from the original assessment because they seemed to measure functional literacy, that is, the essential knowledge and skills in reading required by everyone for effective functioning in society.

Note that the period of time for measuring change is as short as three years and not longer than five years. To the surprise of some, these are sufficiently lengthy periods of time to reveal changes of importance in these three learning areas. This fact alone reemphasizes the dynamic nature of education. Constant monitoring of its output is highly essential. The following results represent the beginning of this effort.

*Changing Levels of Science Achievement*

Changes in level of science achievement were determined during a three-year period for 9- and 13-year-olds and a four-year period for 17-year-olds. But the results are essentially the same in all instances: Achievement in science is declining nationally. To better understand this statement, we need to examine briefly 1) the meaning of the term science as used by National Assessment, and 2) the changes in levels of achievement in science for major groups of American youth, such as students living in the Southeast and in rural areas.

**Table 3**

**Measurement of Changes in Levels of Achievement in Three Learning Areas**

| Learning Area | First Assessment Year | Second Assessment Year | Age Group | Period of Change (Years) |
|---|---|---|---|---|
| Science | 1970 | 1973 | 9 | 3 |
| | 1969 | 1972 | 13 | 3 |
| | 1969 | 1973 | 17 | 4 |
| Writing | 1970 | 1974 | 9 | 4 |
| | 1969 | 1973 | 13 | 4 |
| | 1969 | 1974 | 17 | 5 |
| Reading* | 1971 | 1974 | 17 | 3 |

*Mini-assessment of functional literacy only.

**What is science?** In this instance science can best be defined by examining the objectives on which test items were based. About 50 subobjectives within four major objectives were used. The major objectives are:

1. Students should know fundamental facts and principles of science.
2. Students should possess the abilities and skills needed to engage in the processes of science.
3. Students should understand the investigative nature of science.
4. Students should have attitudes about and appreciations of scientists, science, and the consequences of science that stem from adequate understandings.

More than half the test items are associated with the first objective, approximately one-fourth with the second, and few with the third and fourth. Moreover, those tied to the first objective measure knowledge of basic aspects of physical and biological science—in other words, the scientific facts and principles commonly taught in elementary and secondary schools.

National Assessment does not concern itself with college science or the training of scientists. It emphasizes fundamental,

everyday science that American youth should know to be literate in this vital area, such as scientific facts about nutrition, health, and our environment. Unfortunately, knowledge of this kind of information declined over a three or four year period.

**The national picture.** For 9-, 13-, and 17-year-olds alike, achievement is dropping on most science test questions. This occurred with about two-thirds of the test items, while improved performance was observed on about one-third. This pattern is reasonably consistent in both the physical and biological science questions, and with all objectives.

On the average, the overall drop in science performance at each of the three age levels is about 2 percent—too large to be a chance occurrence. The significance of this amount grows when we realize that it corresponds to a loss of about one-half year of learning experience in science.

Surprisingly, two important low-achieving groups do not follow the national trend: students in the Southeast and in rural areas actually improved their standing compared to the nation in the second assessment in science. In the Southeast, performance was the same or slightly improved in the second assessment as contrasted with the first, while all other regions fell, particularly the western region for ages 13 and 17. Students attending rural schools improved their overall science achievement by approximately 3 percent to 4 percent while the nation declined—a truly remarkable achievement. If these trends continue, these groups could reach the national levels of performance in less than a decade from the time of the second assessment.

On the other hand, it must be kept in mind that all other groups of school-age youth follow the national trend quite consistently. For both male and female, black and white, suburbanites and inner-city dwellers, achievement in science is slipping.

*Changing Levels of Writing Achievement*

Each of the two writing assessments consisted of a number of survey questions, multiple-choice questions, and essay tasks. In this way achievement in both general writing ability and writing mechanics (punctuation, capitalization, spelling, and word usage) are measured. The former is the more difficult to handle in a testing situation. The respondents are given a topic to write an essay about. In one instance, 9-year-olds were given 15 minutes

to write a story about a picture of a jumping kangaroo, and 13- and 17-year-olds were given 26 minutes to write a descriptive essay. They were not instructed to edit or rewrite their essays but were asked to do their best writing.

The essays provide two kinds of information. First, we can judge their overall quality, including such elements as word choice, creative style, expression of ideas, and depth of thought. Second, we can tabulate the mechanical errors like misspelled words, faulty punctuation, and poor grammar.

Comparing essays written in 1969-1970 with those written in 1973-74 reveals some unusual changes. Here are a few highlights for each age group:

**Seventeen-year-olds.**

1. The overall quality of the essays declined in five years, and the percentage of students writing good or excellent papers dropped from 85 percent to 78 percent.
2. Very good writers are as good as they were in 1969, and there are a few more of them. They are writing longer essays without losing coherence or increasing their error rates in areas such as punctuation, word choice, spelling, run-ons, fragments, and so on.
3. Poor writers are worse than they were. They are writing shorter, less stylistically sophisticated essays but are retaining about the same error rates in writing mechanics. More poor essays are incoherent than in 1969.
4. In general, most aspects of writing generally called mechanics and stressed heavily in elementary and junior high school English classes are being handled adequately by the vast majority of students, and deterioration in their use is not evident during the five-year-period.

**Thirteen-year-olds.**

1. The average essay written by 13-year-olds in 1973 is not as good as that written in 1969. Fewer essays are excellent.
2. There is a movement toward shorter, simpler expression. The essays were shorter in 1973; this is largely because they contained fewer phrases within sentences. Also, the vocabulary employed in 1973 was somewhat simpler.

3. A marked increase appeared, particularly among males, in rambling prose, which is somewhat unfocused writing containing more run-on sentences and more awkwardness than was evident in 1969. In other words, the percentage of people adhering to the traditional conventions of written expression decreased.
4. The quality of the essays by both male and female writers dropped in four years, and the drop was greater for males. Thirteen-year-old females clearly surpass males in general writing ability.

**Nine-year-olds.**

1. The percentage of 9-year-olds writing good or excellent papers rose from 51 percent in 1970 to 57 percent in 1974.
2. Nine-year-olds are writing longer, somewhat more sophisticated essays, but they are losing some coherence in the process.
3. Most essays by 9-year-olds are virtually free of run-on sentences, agreement errors, comma errors, period errors, word choice errors, and structure work errors.
4. Very few 9-year-olds write fully developed paragraphs focusing on a topic sentence, and the percentage is decreasing. The most rapid decrease is among the high quality papers.

*Changing Levels of Functional Literacy*

In contrast to the first reading assessment conducted in 1970-71, the mini-assessment of functional literacy is much smaller and more focused. Only 17-year-olds enrolled in schools were retested, and about 25 percent of the test items used in the first assessment were readministered in 1974. Furthermore, these questions were selected to present the formats of reading materials we frequently encounter in everyday life and with which we must be able to cope to function adequately. The reading materials employed are passages such as newspaper articles, stories, and poems; common reference materials used when one seeks information; and graphic materials such as signs, coupons, drawings, charts, maps, and graphs. Included are questions about such things as a telephone bill, a traffic ticket, and an excerpt from an insurance policy.

When administered in 1971 as part of the complete reading

assessment, the test questions for functional literacy proved to be easy for most 17-year-olds. This is reasonable since the questions represent a minimal level of proficiency in reading; mastery is desired. Did the level of success of 17-year-old students rise three years later? Yes, definitely.

All groups gained in functional reading skills, the average national level rising 2 percent. Importantly, groups who had the lowest levels of achievement on the first assessment gained most. In other words, substantial improvement was found for 17-year-old students who are male, black, live in the inner city, or have parents without a high school education. The average achievement of the last group jumped nearly 5 percent.

And, you might ask, what is happening to the two groups of American youth who bucked the downward trend in science achievement, namely, residents of the Southeast and of rural areas? The answer to this question is more encouraging news. Of the four regions of the country, 17-year-old students in the Southeast improved the most—almost 3 percent on the average. Those from rural areas raised their achievement level more than their peers living in other types of communities, registering a sharp gain of more than 4 percent. In total, it's a pleasant picture to contemplate.

## OUR SCHOOLS: A SPECULATIVE VIEW

How comfortable it would be to offer a simple, direct description of the quality of our schools. Then we could relax by bouncing a tidy truism back and forth at board meetings, legislative hearings, committee debates, and cocktail parties.

It just isn't going to happen. No simplistic statement about school quality is possible or ever will be. After all, as compared to two decades ago, school buildings are greatly improved, teachers are better educated. budgets are much larger, and curriculum materials are more extensive—to name just a few major improvements. But are the children better educated? Are their needs and the needs of society being met adequately? The evidence we have says that there are both hopeful and discouraging signs.

If there is to be a score card on American education, no one has yet been clever enough to devise it. Instead, it is more descriptive to view the outcomes of educational effort as analogous to some kind of rugged, mountainous terrain, dominated by inspiring peaks here and there, fronted by low "hogbacks" in the foreground, and laced throughout with deep, shadowed canyons. The complexities of this scene rival those of the patterns of achievement of American youth. Assessment findings show us some of the much needed details of these patterns.

### Perspectives About NAEP Findings

Perhaps the most significant findings of National Assessment are so obvious they are overlooked. First, differences in achievement

among major groups of young Americans are extremely large in virtually all learning areas. Second, consistently sizable changes in levels of achievement in three somewhat dissimilar learning areas occur in as short a period as three to five years. Quite powerful forces must be at work, both inside and outside of the educational enterprise.

*Group Differences*

It hardly raises eyebrows to announce that young people coming from enriched environments succeed well in school while those from poor environments do not. What is unusual is the size of these differences. The achievement levels of those from the affluent suburb, for instance, are typically 6 percent to 10 percent above the national average in school-specific learning areas—learning areas such as science and mathematics strongly influenced by school participation. In contrast, achievement levels of young Americans living in the inner city are often 10 percent to 15 percent below the national average in such learning areas. Sad to say, the differences between white and black respondents are even more extreme.

In learning areas where the influence of schooling is less powerful, the differences decrease. In music and citizenship, the direction of differences among groups is the same, but the sizes of the differences are smaller.

At least two groups show signs of reducing, maybe ultimately eliminating, their deficits in achievement. School-age respondents living in rural areas and in the Southeast improved markedly in two dissimilar learning areas (science and functional literacy) during a period of three or four years. Moreover, there is more good news. One subgroup contributing noticeably to the better-than-average performance of southeastern 9-year-olds in science is black students. They gained about 3 percent in three years, while in contrast all other black 9-year-olds declined 4 percent on the average. This needs further study.

The story is different in writing achievement. The writing ability of 13-year-olds and 17-year-olds dropped for both male and female students. In contrast, the 9-year-olds write the same or better than four years before. Throughout the age groups, command of the rules of writing mechanics did not change much,

but respondents seem to write more like they speak. The latter is not a reassuring trend.

Another thought: Are we satisfied when we discover that American youth achieve only as well in the second assessment as in the first that preceded it by three to five years? Considering the prodigious effort we make to improve our schools, should not our goal be improved performance rather than merely a steady state? If this makes sense, then declines in science achievement and writing ability are even more serious than first supposed, and the improvement in functional literacy simply meets our expectations—nothing more.

Why are the achievement levels not improving? Are the shifts observed due to changes in the schools? In the home? In our society? Or in some interaction among all of these? Though we can only speculate about their relative influence, it is helpful to identify some of these elements of change that seem to be present.

*Forces at Work*

By age 17 the typical young American has spent considerably less than one-third (some say one-fourth) of his waking hours in school or school-related activities. If we consider only the hours of actual instruction in school, the fraction is even less, perhaps on a par with that part of a young life spent watching television programs. Where does this leave the school and its teachers? They are powerful factors, but they are not operating alone.

The single most important input in educational enterprise is the student, who comes to school heavily molded by the home and the society within which it exists. The impact of the school may be almost marginal, except for school-specific learning areas with a heavy intellectual flavor. The NAEP findings clearly show a strong relationship between achievement and student variables that are "givens" for the teacher. Is it possible for a school system, however good its educational processes, to produce high levels of achievement if its students are seriously disadvantaged? Vast improvements can occur, but high levels may well be beyond reality.

**Teachers and teaching.** School faculties today include a large number of university-trained teachers, well schooled in their disciplines and in the principles of behavioral science, carefully

certified and unionized. They tend to worry about the differences between "teaching subject matter" and "teaching students," favoring the latter, and wondering if they can do both.

In keeping with this, warm feelings are expressed for "humanistic" teaching—a desire to help the student develop a better sense of personal worth. In the eyes of a good number of teachers—and parents, if limited surveys are to be believed—this is the primary goal to be achieved, even if knowledge of subject matter is to be sacrificed in part. How a student feels is more important than what he or she knows.

This raises the question of what schools can do best. Beyond doubt schools can perform magnificently when engaged in the task of enlarging a student's command of arithmetic processes or the rules of grammar. How much can they do to cause positive shifts in a student's self-concept, given the uncertainties of the methodology used and the heavy influence of out-of-school factors? Moreover, if you strive mightily for the second goal, does it reduce the likelihood of reaching high levels in the "basics"? In short, is our teaching emphasis on self-growth a factor that has reduced levels of achievement in traditional learning areas and now is causing declines in science achievement and writing ability? It's something to think about.

Another nagging concern is the student reward system. The problem of grade inflation is widely mentioned and may be of the same magnitude as our economic inflation. Virtually all schools, including colleges and universities, are searching for reasons why high grades are more prevalent now than in the past, and SAT achievement scores lower.

Examine the following line of reasoning. As high grades become more common and require only normal effort to obtain, they are less meaningful to students, teachers, and the public. Very likely paper-and-pencil tests, the principal component of grades, are also losing their punch. Since such tests are based almost exclusively on verbal and mathematical skills, is it reasonable to assume that interest in and attention to these skills are slipping? If so, the ripple effect of inflated grades is having a deleterious outcome on levels of achievement in basic skills and various content areas.

Finally, grade inflation suggests an unwillingness by at least

some teachers to apply academic standards systematically. As teachers lower their level of expectation, so will students lower theirs. Now a gentle toboggan slide is operating. The best interests of all concerned, particularly those of students, are not being served, and assessment data reflect this.

**Curriculum and enrollments.** Massive changes have taken place in the curriculum in recent years, particularly in areas like science and mathematics. To an important degree, the emphasis in these learning areas has moved from "understanding how" to "understanding why." This is to be applauded. On the other hand, is it possible that we are doing a better job of teaching those who are seriously interested in science and mathematics but a poorer job for the rank-and-file student? Otherwise stated, are we teaching everyone the principles of an internal combustion engine when the vast majority have an urgent need to learn how to drive better? Certainly there is a place for both experiences, just as there is for set theory from "new math" and the application of arithmetic processes to consumer problems. Has our preoccupation with one interfered with achievement of the other?

Fluctuations of enrollment in secondary school courses may also nudge levels of achievement of 17-year-olds and young adults upward or downward. For instance, slight enrollment declines have been detected in the more theoretically oriented science courses. It is conceivable that these courses are succeeding admirably for those enrolled but have less impact when levels of science achievement are measured for an entire age group.

**Student migration.** The migration patterns of students offer interesting hypotheses about achievement levels reported by National Assessment. Good illustrations of this are found in the changing achievement levels for the southeastern and western sections of the country.

In the Southeast, in-migration is comparatively recent and includes many white-collar workers. Could this be the cause of the improved showing for the Southeast in science achievement and functional literacy?

The western region, dominated by California, has a longer history of in-migration. For many years families from the central

region moved westward, but this movement has slowed appreciably in the 1970s. Are many of the western young adults actually the products of schools in the central region and not those of the western region? Does this explain, at least, why these young adults perform near or above the national average in virtually every learning area, while the 9-year-olds who are presumably the products of western schools, tend to perform at or below the national average? If this question is answered affirmatively, then how does one explain the fact that between 1969-70 and 1972-73 the decline in science achievement for western 9-year-olds was less than the national decline, while those for 13- and 17-year-olds noticeably exceeded the national downward trend?

Student migration within a school district is also a factor to be reckoned with. In urban areas, student mobility is extreme, with new faces appearing and familiar ones disappearing in each classroom almost daily. In addition, absenteeism is a problem.

These conditions are bound to reduce the quality of teaching in spite of the best efforts of teachers, particularly when they are trying to individualize instruction. Could this problem be one of the causes of the poor achievement levels of inner-city youth? In contrast, schools in rural areas have a much more stable student body. Does this factor account for part of the rise in achievement levels of youth in rural areas and the Southeast, which is heavily rural? The strength of the influence of student migration may be difficult to judge, but it probably is large and certainly cannot be ignored.

**Influence of middle-class values.** In the 1960s a frontal attack was made on the so-called middle-class values of our society. This attack was led by college-age youth and drew a great deal of attention, even though both then and now no one is quite sure what middle-class values are.

The reverberations of the shrill voices of the 1960s still continue, but at a lower intensity. What then, has happened to this value system? Probably it is bent but not broken, surviving but not flourishing.

Two features are important to us here. First, the strongest bastion of these values is likely the rural population. Second, difficult as this value system is to describe, it is generally

agreed that it includes the work ethic, that is, the feeling that work is basically noble and rewarding and will lead to greater good. Associated with this is the conviction that upward mobility in our society is facilitated by success in educational endeavors. Schooling is important and must be taken seriously.

Speculate, if you will, about the impact on student achievement caused by any serious erosion of acceptance of the middle-class value system. Could such erosion be one of the causes of low achievement levels in the inner city and increasing achievements in rural areas and the Southeast?

**Epilogue.** It is patently clear that no one is able to identify all of the forces that contribute to high and low levels of achievement, and certainly causal relationships cannot be proved or disproved. Surveys like National Assessment are not designed to probe these matters directly. Instead, they serve as excellent vehicles for generating hypotheses about causes of achievement fluctuations, which in turn can be studied more intensively by designing appropriate experiments or conducting thorough case studies.

## Next Moves

The design of National Assessment is not remaining static. At the same time that it measures changes in achievement that require standard conditions to be maintained for each reassessment, NAEP is refining its methods and focusing its work more tightly on questions about student achievements being raised by educators, politicians, and the general public. Prominent among these refinements are these:

1. More frequent use of special probes, that is, smaller assessments aimed at topics of great interest. Examples: functional literacy and basic mathematics.
2. Addition of more student and school background variables and examination of their relationship to changing levels of achievement. Examples: average cost of educating a student each year; student migration within a school district and between districts; major features of curriculum and instruction such as the use of laboratories in science.
3. Larger samples that will permit the study of achievement of smaller, better defined groups of American youth. Ex-

amples: 17-year-old male blacks living in the inner cities; 9-year-old female whites living in rural areas.

As National Assessment is strengthened, it is better able to determine accurately the nature and amounts of the outcomes of education and their relationship to its inputs and processes. This pioneer work also serves as a model for state- and districtwide assessments. Many states and a scattering of school districts have established regularly conducted assessments, and some of these are borrowing heavily from National Assessment's materials and methods. As a result, action programs to correct deficiencies are being started, and long-range plans for educational improvements are being formulated.

Whether or not patterned after National Assessment, state and district assessments constitute a new and solid data-gathering effort and are highly informative because they are tailored to local interests and conditions rather than national ones. They supplement National Assessment, and it supplements them.

National Assessment findings constitute a superior base on which to mount a wide variety of efforts to revitalize curricula, teaching methods, textbooks, and even teacher education. Systematic gathering of achievement data during a period of years should permit us to draw inferences about the strengths and weaknesses of our educational enterprise and should indicate where improvements are needed.

Deficits in achievement suggest both needs of young Americans and needs for renewed educational effort. Illustrative of this is the assessment of the achievements of young adults. Findings in such diverse areas as consumer mathematics, writing mechanics, functional literacy, career education, and citizenship (specifically, understanding the Bill of Rights), reveal graphically the educational needs of this age group. This assists materially in the solution of problems associated with developing curriculum and teaching materials for adult and continuing education programs.

All of the foregoing demonstrate that National Assessment is a beginning point, not an end point. Revealing the weaknesses in achievement certainly leads to a more accurate direction of remedial programs and establishes a base for evaluating their

effectiveness. Now a better foundation for determining accountability is available to us.

To be a professional is to be accountable. All in that role must assume that they are responsible for decisions made and actions taken and are subject to review by those with power to displace them. This is not as simple as it sounds. For instance, for teachers to be accountable, careful consideration must be given to the environment within which learning is taking place. The nature of the student body, the teaching conditions, and a myriad of nonschool influences must be considered.

In view of this, it is necessary to prepare a carefully written agreement about what is expected to result from the teacher's efforts; the agreement must be stated in terms of specific student objectives to be achieved. Moreover, criteria for evaluation are needed, with levels of acceptable performance pre-established by the reviewer. Now the teacher knows what is expected and not expected.

Assessment procedures and findings assist significantly in strengthening accountability efforts. First of all, lengthy statements of educational objectives, reviewed and selectively modified, can yield specific student objectives that are a part of a hierarchy of objectives. This helps integrate the teaching-learning effort. Then, test items from assessments can provide efficient means of gathering data about the degree to which objectives have been achieved. Lastly, national, state, and district assessment findings can be considered bench marks for pre-establishing levels of acceptable achievement and interpreting the final results.

The assessment movement and the accountability movement are alive and strong, and education is the better for them. It pays to gather systematically large amounts of high quality information about all aspects of our educational system. The more we know, the better we can decide—and the sooner we will improve.

**Annotated Bibliography**

Ahmann, J. S., and others. Science achievement: The trend is downward. *The Science Teacher*, 1975, 42, 23-25.

For the first time changes in national levels of science achievement for 9-, 13-, and 17-year-olds are reported. A decline in science achievement occurred in three years, though young Americans living in rural areas gained noticeably, and those living in the Southeast either remained unchanged or improved slightly.

Fair, J. (Ed.) *National assessment and social studies education*. Washington: National Council for the Social Studies, 1975.

The chapters in this book are the product of a serious attempt made by selected members of the National Council for the Social Studies to interpret NAEP findings in citizenship and social studies. In total, the book is illustrative of the kind of follow-up work needed so that assessment findings influence educational decisions and plans.

Johnson, S. S. *Update on education*. Denver, Colorado: National Assessment of Educational Progress, 1975.

A bright, easily read digest of National Assessment findings in seven learning areas. It contains far more of these findings than this fastback, but far fewer than the tens of reports published by NAEP.

National Center for Education Statistics. *The condition of education*. Washington: U.S. Government Printing Office, 1975.

This volume attempts to describe and interpret the condition of American education in a comprehensive statistical report. It uses NAEP data to describe the educational attainments of young Americans and also includes considerable information about financing schools and the elementary, secondary, and higher education enterprises.

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